EXHIBIT 5
REDACTED

UNITED STATES DISTRICT COURT

EASTERN DISTRICT OF TEXAS

SHERMAN DIVISION

The State of Texas, et. al.	Case No: 4:20-cv-00957
Plaintiff,	
v.	
Google LLC,	
Defendant.	

Expert Report of Parag Pathak

June 7, 2024

Parag Pathak

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IV.   SUMMARY OF OPINIONS

16. The "Ad Tech Stack" has three distinct entities – publishers, advertisers, and exchanges – each with distinct incentives. Publishers seek to maximize the value they receive from selling display advertisements. Advertisers seek to maximize the value they receive from the advertisements they purchase. Exchanges seek to maximize revenue by finding the best matches between publishers and advertisers.

17. Buyers and sellers in marketplaces have opposing interests. A buyer wishes to pay less for an impression, while a seller wants to receive more. The marketplace operator wishes to maximize trading volume and steer traffic to its exchange over competing alternatives. Because Google is involved with all three entities, it has an inherent conflict of interest. Maximizing the interests of one type of participant may harm the interests of another type of participant. Google's conduct in the Ad Tech Stack results from conflicts of interest due to being involved in all sides of digital advertising transactions.

18. Well-functioning digital advertising marketplaces should aim to maximize the surplus of their participants. Publishers benefit from the opportunity to match and transact with more advertisers. Advertisers benefit from the opportunity to match and transact with more publishers. Market clearing rules and the terms of trade should be made known to all participants so they can make optimal choices. Participants should have a clear understanding of how their actions, such as their bidding behavior or setting price floors, translate into market outcomes, such who is matched together, what prices participants paid, and why they paid them. A marketplace with more participation will lead to more opportunities to find matches and more total surplus. Moreover, marketplace participants should compete on a level playing field, where they feel safe and do not need to worry that some participants have unfair advantages because of information asymmetries or special arrangements.

19. The anticompetitive conduct discussed by Professor Gans has resulted in digital advertising marketplaces that do not function well because they do not follow these principles. Specifically:

    A. Google's requirement that publishers who use its DFP ad server must license Google's AdX worked against the interests of publisher customers by limiting their choice and protected AdX from the threat of disintermediation. Google Ads exclusivity to AdX denied advertisers the option to participate on other third-party exchanges, where they could have found better matches and realized greater surplus.

9

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with the match is $4. If a marketplace matches buyer 1 to the seller rather than buyer 2, it generates an inefficient match. Poor marketplace design can impede marketplace efficiency.

35. I have spent most of my career researching and designing matching marketplaces to produce efficient and other desirable outcomes. This work includes studying and proposing centralized mechanisms for student assignment to schools, cadets to military posts or "branches," and medical residents to their first internships. For example, in Pathak and Sönmez (2013), with my co-author, I develop a method to measure the extent to which different market-clearing mechanisms encourage straightforward behavior by participants. I apply this method to analyze the extent to which participants have incentives to behave honestly across different centralized matching and auction systems.[12]

36. Market design frameworks and techniques have been used to analyze many real-life marketplaces, such as centralized school choice systems,[13] college admissions,[14] organ donation and exchange systems,[15] medical residency clearinghouses,[16] military personnel job assignment,[17] and other labor markets.[18] Market design tools and principles have also been used to analyze online markets, including auctions in online marketplaces like Amazon and eBay,[19] and online advertising.[20] While these markets may seem different from one another, the goal of each is to facilitate matches; economics, therefore, refers to them as "matching markets" or "matching marketplaces."

37. The exchange market for display advertising is a matching marketplace. Advertisers wish to be matched with users who visit publisher websites. Publishers wish to be matched with advertisers who are willing to pay the most for their inventory at a commensurate level of

[12] Pathak, P. A., & Sönmez, T. (2013). *School admissions reform in Chicago and England: Comparing mechanisms by their vulnerability to manipulation*. American Economic Review, 103(1), 80-106.

[13] Abdulkadiroğlu, A., & Sönmez, T. (2003). *School Choice: A Mechanism Design Approach*. American Economic Review, 93: 729-747.

[14] Gale, D., and Shapley, L. (1962). *College Admissions and the Stability of Marriage*. American Mathematical Monthly, 69: 9-15.

[15] Roth, A.E., & Sönmez, T., and Utku Unver, M. (2005*). Pairwise Kidney Exchange. Journal of Economic Theory*, 125(2): 151-188.

[16] Roth, A.E. (1984). *The Evolution of the Labor Market for Medical Interns and Residents: A Case Study in Game Theory*. Journal of Political Economy, 92: 991-1016.

[17] Sönmez, T., and Switzer, T. (2013). *Matching with (Branch-of-Choice) Contracts at the United States Military Academy*. Econometrica, 81(2): 451-488.

[18] Kelso, A.S., Crawford, V. (1982). *Job Matching, Coalition Formation, and Gross Substitutes*. Econometrica, 50: 1483-1504. *See also* Bulow, J., Levin, J. (1982). *Matching and Price Competition*. American Economic Review, 96 (3): 652-668.

[19] Roth, A. E., and Ockenfels, A. (2002). *Last-Minute Bidding and the Rules for Ending Second-Price Auctions*: Evidence from eBay and Amazon. American Economic Review, 92(4): 1093-1103; *See also* Ely, J.C. and Hossain, T. (2009). *Sniping and Squatting in Auction Markets*. American Economic Journal: Microeconomics, 1(2): 68-94.

[20] Edelman, B., Ostrovsky, M., and Schwarz, M. (2007*). Internet Advertising and the Generalized Second Price Auction: Selling Billions of Dollars of Keywords*. American Economic Review, 97(1): 242-259.

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==quality.==[21] As a result, the insights and principles from market design research on matching marketplaces are relevant to the analysis of Google's conduct.

38. After participants are matched together in a marketplace, a marketplace must specify their terms of trade, or how the marketplace clears. A common way to determine the terms of trade is through an auction, where bidders submit bids, and the auction procedure determines the winner and how much bidders must pay. The close connection between matching and auction theory makes these two subfields of microeconomics core pillars of the market design field. In the marketplace for display ads, many impressions are traded in auctions held near-instantaneously when a viewer browses a webpage. As a result, auction theory, which I teach as part of my undergraduate and graduate courses, provides the relevant tools to analyze Google's exchange from a market design perspective.

39. Market designers consider the key elements of successful markets.[22] Market design economist Alvin Roth summarizes that "To function properly, markets need to do at least three things:

> 1. They need to provide **thickness**—that is, to bring together a large enough proportion of potential buyers and sellers to produce satisfactory outcomes for both sides of a transaction.

> 2. They need to make it **safe** for those who have been brought together to reveal or act on confidential information they may hold. When a good market outcome depends on such disclosure, as it often does, the market must offer participants incentives to reveal some of what they know.

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[21] For instance, a publisher may want to block all ads with inappropriate content

[22] *See* Haeringer, G. *Market Design: Auctions and Matching. Chapter 1.3.1 What a Market Needs to Work*. The MIT Press, 2017. pg. 3-4. *See also* Roth, A.E. (2007). *The Art of Designing Markets*. Harvard Business Review. Available at https://hbr.org/2007/10/the-art-of-designing-markets.

I will also use principles from my research on school choice mechanisms. "What really matters are basic issues that market operations in other context would likely be concerned about: straight-forward incentives, transparency, avoiding inefficiency through coordination and well-functioning aftermarkets, and influencing inputs to the design, such as applicant decision-making and the quality of the schools." *See* Pathak P.A. *What Really Matters in Designing School Choice Mechanisms*. In: *Honoré B*, Pakes A, Piazzesi M, Samuelson L, eds. Advances in Economics and Econometrics: Eleventh World Congress. Econometric Society Monographs. Cambridge University Press; 2017:176-214.

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2) Reserve Prices

71. A reserve price is a price set by sellers which is the minimum price required to sell the item. If no bidder bids higher than the seller's reserve price, the item is not sold. In a second-price auction, the reserve price can become the clearing price if the highest bidder bids above the reserve price and the second highest bid is below the reserve price.

72. Sellers set reserve prices to maximize their revenue, but they can also use reserve prices for additional objectives depending on the auction context. Literature on auction theory, including Myerson (1981) and Riley and Samuelson (1981), analyzes how auctions should be designed to generate the highest seller revenues. This research shows setting reserve prices optimally allows sellers to maximize revenue. A higher reserve price leads to (a) a higher clearing price if the good is sold but also (b) a lower probability of the good being sold. Hence, the optimal reserve price involves tradeoffs between these two factors. In the context of display advertising, reserve prices can be a useful tool for publishers who want to block an advertiser from purchasing their impression because they may not want a visual from that advertiser appearing on their website. They can achieve this by setting a relatively high floor for that advertiser or a relatively high reserve price for an exchange known to transact low-quality ads.

73. Reserve prices can also convey information on the quality of the item being sold. When bidders are unsure about an item's quality, Cai, Riley, and Ye (2007) show that the seller can use the reserve price to signal the item's quality.[48] When a reserve price is higher, bidders may infer that the auctioned item has higher quality because the seller risks the item going unsold by setting a high reserve. In the context of display advertising, a publisher can signal that a new impression is of high value by setting a high reserve price. A high reserve price can signal to the advertisers that the publisher thinks either (a) they can find an advertiser from another demand source who is willing to pay at least the reserve price amount for this impression or (b) their own valuation of the impression is equivalent to at least the reserve price, to display their own "house ads."[49] This, in turn, informs advertisers that this impression has a high value, and so the advertiser needs to

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[48] Cai, H., Riley, J., & Ye, L. (2007). *Reserve price signaling*. Journal of Economic Theory, *135*(1), 253-268

[49] House ads are used by publishers to promote their own products or services. As a result, they do not generate ad revenue, but can create revenue from the sale of products or services. For example, the Houston Chronicle can utilize house ads to advertise its subscription service. For Google documentation on house ads, *see* Google Ad Manager Help. "House line items". Accessed on June 4, 2024. https://support.google.com/admanager/answer/79305?hl=en.

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79. Publishers may contract directly with advertisers through "direct deals" in which the two parties agree to an outcome of interest to the advertiser (*e.g.*, the number of clicks from website visitors) sold at a specific price and associated total spending amount.[53] To facilitate "direct deals," a publisher may employ sales teams that cultivate relationships with advertisers and negotiate agreements.

80. Publishers also may contract with exchanges to sell display advertisements through private or open auctions.[54] In such cases, a publisher would use the exchange(s) to act as matchmaker(s) with advertisers and facilitate reaching terms for displaying ads on the publisher's website (i.e., outcomes of interest, purchase quantities, prices).[55] Publishers contract with an exchange to offer their inventory for sale through that exchange. These contracts stipulate revenue sharing terms between the publisher and the exchange, in which the exchange takes as payment a portion of the revenue generated from selling the publisher's inventory. It is my understanding that Google's AdX exchange currently has a share of approximately 55% within the Ad Exchange Market.[56] In addition to Google's AdX, there are other display advertising exchanges including AppNexus/Xandr (owned by Microsoft), Index Exchange, Magnite (formerly Rubicon), OpenX, Pubmatic.[57]

81. Publishers use ad servers to manage their relationships with (and flow of inventory to) advertisers and exchanges.[58] Publishers offer their inventory for sale through technical steps which require

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[53] "Publishers typically use different selling strategies for the different types of inventory. For extremely exclusive inventory, such as a publisher's homepage, where a publisher wants full control over the ads that appear alongside their most valuable content, a publisher will typically sell this inventory directly to buyers for an agreed upon number of impressions, date-range, and price. On the other end of the spectrum, publishers may have inventory that has gone unsold. For this inventory, publishers may be willing to forego some level of control over the ads that appear in order to sell the inventory. In situations like this, publishers would make this inventory available for sale in an open auction using a sell-side platform (SSP) such as DoubleClick Ad Exchange for thousands of advertisers to bid on." See Think with Google. "The Buyer's Guide to Programmatic Direct." Google Whitepaper (July 1, 2016). Accessed on June 4, 2024. Available at https://www.thinkwithgoogle.com/intl/en-apac/marketing-strategies/automation/buyers-guide-programmatic-direct/

[54] Open auctions and private auction were deal types available to publishers to sell digital advertising inventory. *See* GOOG-AT-MDL-014349706 at-712. June 2020. "Programmatic Direct - Competitor Intelligence" - Internal Google presentation; *See also* Think with Google. "The Buyer's Guide to Programmatic Direct." (July 1, 2016). Accessed on June 4, 2024. Available at https://www.thinkwithgoogle.com/intl/en-apac/marketing-strategies/automation/buyers-guide-programmatic-direct/

[55] "(Ad) Exchange is an online, auction-driven marketplace where ad impressions are sold and bought in real time.

Publishers can place exchange tags on their websites, which will send ad requests to the exchange with every impression.

Bidders can bid for each impression - how much they want to pay and what ad they want to display.

Exchange selects the winner and displays the ad." GOOG-AT-MDL-001004706 at-708. June 2019. "Ad Manager Ecosystem 101" - Internal Google presentation by ████████████████████████.

[56] Discussion with Professor Gans on June 6, 2024.

[57] Discussion with Professor Gans on June 6, 2024

[58] "Ad Server is a tool that lets publishers: Decide where on their pages ads run, Create and manage campaigns, Target campaigns to certain users or places. Traditionally there is direct relationship between advertisers and publishers, campaign assets are sent over via email and all configuration is done in the publisher's ad server based on a signed order form." GOOG-AT-MDL-001004706 at-707. June 2019. "Ad Manager Ecosystem 101" - Internal Google presentation by ████████████████████████.

28

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them to create "line items" in the ad server that correspond to the advertisers and exchanges with which the publisher contracts.[59] These line items are technical settings from the publisher that can be used to reflect the value of direct deals with advertisers or the reserve prices a publisher sets for an exchange. When a user visits a publisher's website, the publisher ad server will match this user to a relevant ad.[60] The publisher ad server then determines which ads to serve to that user based on available line items, which represent demand from direct deals with advertisers or from ad exchanges, the details of this process are further described in Figure 2.[61]

Figure 2: Example Ad Serving Process Flow with Line Items

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[59] "Line Items represent campaigns / campaign elements within AdManager. There is a structure of objects within AdManager that lets you define your campaigns, but Line Items are the unit at which AdManager delivery operates on.
GOOG-AT-MDL-001004706 at-719. June 2019. "Ad Manager Ecosystem 101" - Internal Google presentation by ▮▮▮▮▮ ▮▮▮▮▮▮▮▮▮▮.

[60] "Ad Manager's ad selection process is designed to deliver the right ad to the right customer at the right time. Below is the process that Ad Manager follows to select an ad to serve: A user's web browser or mobile device loads an Ad Manager ad tag (on a site) or Ad Manager ad code (in an app) and triggers an ad request, which passes information to the ad server." Google Ad Manager Help. "Ad selection white paper." Accessed on June 4, 2024. Available at
https://support.google.com/admanager/answer/1143651#overview_of_the_ad_selection_process

[61] "Once the ad server gathers the relevant information for the ad request, it generates a list of all line items and yield groups that match a subset of the targeting criteria of the request." Google Ad Manager Help. "Ad selection white paper." Accessed on June 4, 2024. Available at https://support.google.com/admanager/answer/1143651#overview_of_the_ad_selection_process

GOOG-AT-MDL-000993446 at-454. Feb. 2018. "When the game changes: How HB affects Yield management in DRX" - Internal Google presentation by Stefania Montagna. DRX is another term for DFP and AdX. (bottom) GOOG-AT-MDL-001004706 at-722. June 2019. "Ad Manager Ecosystem 101" - ▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮.

29

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B. Overview of Digital Advertisers

82. Advertisers seek to optimize the return generated by the display advertisements they purchase and show to web users.[62][63] Advertisers seek to spend their allocated display advertising budgets in the most efficient manner, with goals such as maximizing the number of people that see their ad (referred to as reach), maximizing the number of viewers that click on their ad, or displaying ads to web users that meet a specific targeting profile.[64] Advertisers may purchase directly from publishers (i.e., direct deals), through ad buying tools, or work with an agency to facilitate purchases.[65]

83. Advertisers may use ad buying tools to place bids on inventory sold through exchanges.[66] Ad buying tools offer functionalities including managing campaigns, setting targeting criteria on which users to reach, and budget management.[67] Ad buying tools available to small advertisers offer more limited functionality, allowing advertisers to set targeting criteria and budgets, while

[62] ███

[63] ███

[64] "While Google Ads search ads show up to potential customers the moment that they start looking on Google for what you offer, display ads show up while people are visiting sites across the Google Display Network. So, how do you know if the people seeing your display ad are interested in what you offer?

Google Display Network (GDN) targeting allows you to set where or when your ad is shown based on features of your ideal audience, such as their personal interests, age or gender." Google Ads. "Reach a larger or new audience with Google Display Network targeting." (March 20, 2023). Accessed on June 4, 2024. Available at https://ads.google.com/intl/en_us/home/resources/articles/reach-larger-new-audiences/

[65] An internal Google document maps the flow of demand and supply between the advertiser tools, exchange, and publisher tools. GOOG-AT-MDL-004523197 at -197. Mar. 13, 2018. "Display Ads Landscape" ████████████████████████████

"Publishers typically use different selling strategies for the different types of inventory. For extremely exclusive inventory, such as a publisher's homepage, where a publisher wants full control over the ads that appear alongside their most valuable content, a publisher will typically sell this inventory directly to buyers for an agreed upon number of impressions, date-range, and price. On the other end of the spectrum, publishers may have inventory that has gone unsold. For this inventory, publishers may be willing to forego some level of control over the ads that appear in order to sell the inventory. In situations like this, publishers would make this inventory available for sale in an open auction using a sell-side platform (SSP) such as DoubleClick Ad Exchange for thousands of advertisers to bid on." Think with Google. Google whitepaper titled "The Buyer's Guide to Programmatic Direct." (July 1, 2016), at page 6. Accessed on June 4, 2024. Available at https://www.thinkwithgoogle.com/intl/en-apac/marketing-strategies/automation/buyers-guide-programmatic-direct/

[66] "DSPs [Demand Side Platforms – ad buying tools] respond to ad exchange bid requests by sumitting which campaign and for which price they want to show on a given impression." GOOG-AT-MDL-001004706 at-711. June 2019. "Ad Manager Ecosystem 101" - Internal Google presentation by ████████████████████████████.

[66] GOOG-AT-MDL-001004706 at-711. June 2019. "Ad Manager Ecosystem 101" - Internal Google presentation ████████████████████████.

[67] GOOG-AT-MDL-001004706 at-711. June 2019. "Ad Manager Ecosystem 101" - Internal Google presentation ████████████████████████████████.

30

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==the tool determines the amount to bid on impressions. Ad buying tools that are available to large advertisers offer more functionality, such as allowing advertisers to create custom algorithms that determine how much to bid on available impressions.==[68] To use an ad buying tool, the advertiser (regardless of size) must contract with the tool provider and generally pay a commission to the provider for each impression won.[69]
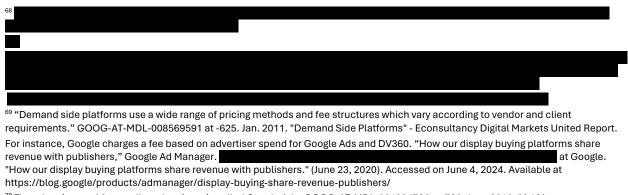
84. Google's Google Ads (formerly known as AdWords) is an ad buying tool available to small advertisers. Other ad buying tools available to small advertisers include Yahoo! Network, Taboola, and Microsoft Advertising.[70]

85. Google's DV360 (formerly known as DBM) is an ad buying tool available to larger advertisers. Other ad buying tools available to large advertisers include the Trade Desk, Criteo, Verizon, and Amazon.[71]

C. Google's Ad Technology Products

1) Google Buying Tools – Google Ads and DV360

86. ==Google has two ad buying tools – Google Ads, which is for smaller advertisers, and DV360, which is for larger advertisers.==[72] Both of these tools charge advertisers a fee based on the percentage of the overall cost of impressions won on the tool.

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[69] "Demand side platforms use a wide range of pricing methods and fee structures which vary according to vendor and client requirements." GOOG-AT-MDL-008569591 at -625. Jan. 2011. "Demand Side Platforms" - Econsultancy Digital Markets United Report. For instance, Google charges a fee based on advertiser spend for Google Ads and DV360. "How our display buying platforms share revenue with publishers," Google Ad Manager. ██ at Google. "How our display buying platforms share revenue with publishers." (June 23, 2020). Accessed on June 4, 2024. Available at https://blog.google/products/admanager/display-buying-share-revenue-publishers/

[70] The advertiser tool for smaller advertisers is called Google Ads. GOOG-AT-MDL-001004706 at-708. June 2019. "Ad Manager Ecosystem 101" - Internal Google presentation by ████████████████████████. Discussion with Professor Gans on June 6, 2024.

[71] GOOG-AT-MDL-001004706 at-708. June 2019. "Ad Manager Ecosystem 101" - Internal Google presentation by ████████ ████████████████. Discussion with Professor Gans on June 6, 2024.

[72] "Q: Is there a platform for smaller users? Because I understand that DV360 is more for large customers; is that right? A: Display & Video 360 is our licensed DSP software, typically is licensed by agencies and sophisticated advertisers with complex marketing campaigns. We also offer the ability to purchase display ads through Google Ads produce which is a product that provides search, displaying, YouTube and video advertisers, and we have customers who use both of those products often simultaneously."

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of Dynamic Allocation would have been if publishers could have chosen which exchange to grant
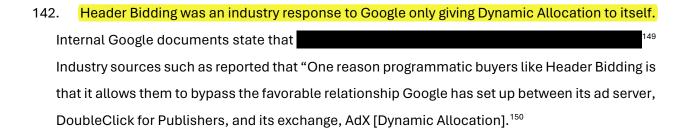Dynamic Allocation.

B.   Google was threatened by the potential of Header Bidding
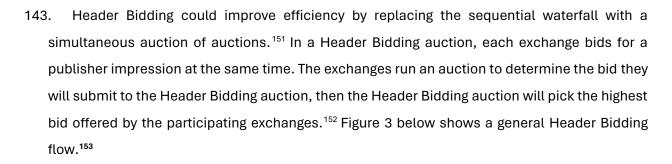
139.   Google was threatened by "Header Bidding" - a technological innovation developed by the
industry to enable ad exchanges to bid on real-time publisher impressions simultaneously.
Header Bidding addressed publisher concerns around Dynamic Allocation and enabled
publishers to increase yields by facilitating real-time price competition between exchanges.

140.   Google set out to undermine the adoption of Header Bidding to protect its ad exchange and
ad server products. Header Bidding benefited publishers by increasing yields, providing more
control over the ad-selection process, and reducing operational overhead from implementing
waterfall auction mechanisms. First, Google did not participate in Header Bidding. Second,
Google limited the number of line items that publishers could set up in DFP thereby limiting DFP
publishers' ability to implement Header Bidding efficiently. Third, Google limited publishers'
ability to measure the performance of Header Bidding by redacting data fields in its Bid Transfer
files that enabled publishers to match impressions to bids. Fourth, Google implemented its own
server-side alternative to Header Bidding called "Exchange Bidding" which continued to provide
preferential treatment to AdX by implementing a 5% take rate for third-party exchanges from
which AdX was exempt. Finally, Google entered into an agreement with Meta to have Meta's
"Facebook Audience Network (FAN)" not compete in Header Bidding in exchange for advantages
in Exchange Bidding.

141.   Google's initiatives to undermine Header Bidding reduced marketplace efficiency by skewing
the allocations of impressions to favor AdX through Exchange Bidding and reducing the ability of
other exchanges to compete in real-time. Absent the conflicts of interest arising from Google's
suite of display advertising products, DFP would have no incentive to undermine a technology
that would maximize value for its publisher customers. Instead, DFP would implement
technologies such as Header Bidding to increase publisher yields, enable greater control over
the ad-selection process, and reduce operational overhead for its publisher customers.

GOOG-TEX-00513684 at-684. April 10, 2015. "███████████████████████████████
████████"

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1) Introduction to Header Bidding

142.   <mark>Header Bidding was an industry response to Google only giving Dynamic Allocation to itself.</mark> Internal Google documents state that ████████████████████████████████████[149] Industry sources such as reported that "One reason programmatic buyers like Header Bidding is that it allows them to bypass the favorable relationship Google has set up between its ad server, DoubleClick for Publishers, and its exchange, AdX [Dynamic Allocation]."[150]

143.   Header Bidding could improve efficiency by replacing the sequential waterfall with a simultaneous auction of auctions.[151] In a Header Bidding auction, each exchange bids for a publisher impression at the same time. The exchanges run an auction to determine the bid they will submit to the Header Bidding auction, then the Header Bidding auction will pick the highest bid offered by the participating exchanges.[152] Figure 3 below shows a general Header Bidding flow.[153]

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[149] "██

[150] Sarah Sluis, AdExchanger. "The Rise Of 'Header Bidding' And The End Of The Publisher Waterfall" (Jun. 18, 2015). Accessed on June 4, 2024. Available at https://www.adexchanger.com/publishers/the-rise-of-header-bidding-and-the-end-of-the-publisher-waterfall/

[151] Likewise, in the counterfactual world with a separate DFP entity there would be little incentive to grant exclusive or preferential technical access between AdX and ad servers, as is currently the case between AdX and DFP with Dynamic Allocation. As discussed in Section IX.C, Google had explored extending Dynamic Allocation to third-party ad servers going so far as to launch beta tests. However, Google abandoned such efforts as a tool to improve the attractiveness of their joint ad serving and exchange offerings through DFP and AdX. If DFP were a standalone entity, Google would have an incentive to extend Dynamic Allocation to third-party ad servers to increase revenue for AdX by facilitating the sale of additional inventory because of the advantageous real-time-pricing information it offers. Conversely, if DFP and AdX were still under the Google umbrella, but the contractual unification between the two was eliminated, Google would still have an incentive to restrict to Dynamic Allocation just DFP as a means of improving the attractiveness of their product suite.

[152] "In a waterfall, the seller creates a prioritized ranking of their buyer partners. Each time an impression is available for sale, the top partner in the ranking is shown the opportunity and has the option to buy it or refuse it. If they choose to buy, they deliver their ad. If they refuse, the waterfall shows the impression to the next partner in the ranking, and the cycle repeats until a willing buyer is found.

The waterfall's design limits publishers' ability to maximize yield, because it doesn't expose impression opportunities to all of the potential buyers and can't find the best price for each impression. Its sequential nature also makes it a slow process, which causes some impressions to go unsold." Prebid. "A Video Introduction to Header Bidding." Accessed on June 4, 2024. Available at https://docs.prebid.org/overview/intro-to-header-bidding-video.html

[153] GOOG-TEX-00105361 at-363. Apr. 28, 2017. "FAN Bidding in to DRX and AdMob" - Internal Google presentation with ████ ██████████████

50

barriers for publishers and advertisers to participate in third-party ad servers and exchanges. Interoperability also lowers entry barriers because it lets new participants work with existing tools and compete with Google's products on the merits. Publishers and advertisers will be able to choose the tool that best fits their needs with unrestricted access to other third-party ad servers and exchanges.

219.   Internal separation with best interest duties and firewalls help yield **straightforward incentives**, whereby each tool in or interacting with the marketplace will have the appropriate incentives to maximize the objectives of the side of the marketplace they represent. For example, an ad buying tool would solely aim to further the interests of advertisers and a publisher ad server would solely represent the interests of publishers. Internal separation would require Google's ad server, exchange, and ad buying tools to be separate entities inside Alphabet. As part of internal separation, each tool would have best interest duties to its customers and firewalls would need to be in place to prevent data sharing between tools, including the results of experiments. Internal separation and firewalls aim to align the incentives of tools with their customers' goals. However, internal separation requires strict monitoring to ensure commitments are upheld.

220.   Behavioral remedies around auction disclosures increase **transparency** in the marketplaces. Google's conduct has lowered transparency by changing auction rules without the knowledge or consent of publishers or advertisers. When publishers or advertisers are not clear about auction rules, they do not know how best to respond and the best way to transact. For instance, advertisers need clarity on what auction is being run (*e.g.*, first-price vs second-price), as the auction format informs how advertisers place bids. Disclosures such as granular bid transaction data and routing rules allow publishers and advertisers to audit Google's conduct. If publishers and advertisers know Google's conduct and can audit outcomes, they can decide whether to change their strategies or use another tool. However, it is difficult to design transparency requirements that identify and protect against future concerns and conduct that reduces transparency.

C. Non-discriminatory interoperability lowers barriers in the Ad Server and Exchange Markets

221.   A rule requiring non-discriminatory interoperability would facilitate access to Google's exchange and increase competition in the Publisher Ad Server Market. Such a rule would mean

79

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that Google cannot impose restrictions on publishers' ability to offer their inventory to exchanges and other demand sources, *e.g.*, would allow publishers using third-party ad servers to offer their inventory for sale through AdX. Non-discriminatory interoperability would allow publishers' choice over the terms of sale and their advertising trading partners. Interoperability helps make markets become thick because interoperability increases access points for publishers and advertisers to participate. Interoperability between third-party ad servers and AdX increases the number of publishers who can use AdX from an ad server of their choice. Interoperability between Google Ads and third-party exchanges increases available inventory for Google Ads and increases demand on other exchanges.

222.   Beyond increasing access, interoperability should also be "non-discriminatory," so that third parties have the same access to publishers and advertisers as Google.[242] For instance, when Google allowed third-party ad servers to access AdX, only DFP and not third-party ad servers could receive real-time bids from AdX. In addition, while Exchange Bidding allowed third-party exchanges to compete for DFP impressions, it charged a 5% fee to third-party exchanges that AdX did not incur.

223.   Furthermore, with non-discriminatory interoperability Google tools should not give information advantages to other Google tools. For instance, with Last Look, the DFP ad server gives AdX an information advantage over Header Bidding, by allowing the clearing price of the second-price auction (AdX) to be only a penny more than the result a first-price auction (Header Bidding).[243] Google has continued to offer information advantages as part of Minimum Bid to Win. Unequal treatment such as this tilted the balance in favor of Google's products.

224.   Non-discriminatory interoperability can address Google's tying conduct, which restricted third-party ad servers' access to AdX. In this section, I consider three applications where non-

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[242] Scholars also use the term "equitable interoperability." "'Equitable interoperability' means that an entrant can not only join the platform, but join on qualitatively equal terms as others, without being discriminated against by the dominant platform that might have its own competing service. Equitable interoperability facilitates competition in innovation and differentiation by digital services but entails oversight by a regulator that determines when advances should become part of the regulated interface. It effectively prohibits self-preferencing and discrimination against firms that are not part of the dominant ecosystem." *See* Morton, F.M.S. et al. (2023). Equitable Interoperability: The "Supertool" of Digital Platform Governance. Yale Journal on Regulation. 40(3): 1013-1055 at-1016.

[243] "██
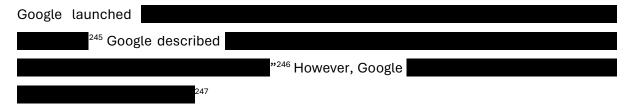
discriminatory interoperability rules can increase participation and market thickness, thereby improving competition in digital advertising marketplaces. First, I consider interoperability between third-party ad servers and AdX. Second, I consider interoperability between Google Ads and third-party exchanges. Third, I consider interoperability between DFP and third-party exchanges.

225. Finally, for non-discriminatory interoperability to be effective, publishers and advertisers need to be able to make choices about what tools they use. For instance, as I've discussed above in Section XI, reserve prices are a tool publishers have to control for quality. Undoing UPR restores DFP publishers' ability to decide on the appropriate reserve prices for exchanges and ad buying tools.

1) Non-discriminatory interoperability between third-party ad servers and AdX

226. Google's tie restricts competition in the Publisher Ad Server Market by restricting third-party ad servers' access to AdX because publishers must forgo access to AdX if they wish to use a third-party ad server. A non-discriminatory interoperability rule would mean that Google cannot restrict third-party ad servers ability to offer their inventory for sale through AdX.

227. Non-discriminatory interoperability between third-party ad servers and AdX increases participation by publishers who use third-party ad servers on AdX. As a result of increased participation, marketplace efficiency for publishers and advertisers on AdX increases, because there is more inventory available to make matches.

228. Another benefit of non-discriminatory interoperability for third-party ad servers is that it allows publishers to choose what best meets their needs without losing access to AdX demand. Publishers could opt not to use DFP without fear of losing access to demand. The potential to switch puts pressure on third-party ad servers to compete to attract publishers. Publisher ad servers could entice publishers to switch to improved ad server offerings, which brings forth the beneficial effects of competition.

229. A rule requiring non-discriminatory interoperability would require AdX to allow access from third-party ad servers and allow third-party ad servers to receive real-time bids from AdX. Prior

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to Google's November 2017 reformulation of DFP and AdX into a unified contract, third-party ad servers were allowed access to AdX. However, as I discuss in Section IX.C, third-party ad servers could not access real-time bids from AdX and only used static bids. As a result, the interoperability that Google offers to third-party ad servers was still discriminatory.

230.   Real-time access to ad exchanges lowers barriers in the Publisher Ad Server Market and restricted real-time access lowers participation of non-DFP publishers on AdX. Publishers have acknowledged that if they could have the same access to AdX via a third-party ad server, then they would consider switching ad servers.[244] As a result, real-time access to exchanges lowers barriers in the Publisher Ad Server Market and increases the ability for third-party ad servers to compete. Google had the technology to give real-time access to third-party ad servers and recognized the need for real-time access for third-party ad servers. As I discuss in Section IX.C, Google deprecated the technology for real-time prices to third-party ad servers to strengthen the unification of AdX and DFP.

231.   Google has also already granted non-discriminatory interoperability to select ad servers. Google launched ██ ████████████[245] Google described ███████████████████████████████████ ██████████████████████████████"[246] However, Google ███████████████████████ ████████████████████████████[247]

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[244] I understand that switching costs still act as barriers for publisher ad servers.
"Q: But can you tell the jury what ██
███
███
███
[245] "██
██
[246] Emphasis included in original. GOOG-AT-MDL-001941178 at-179. Nov. 2017. "Demand Product Primer" - Internal Google presentation.
[247] "███
███████████████████████████████████

82

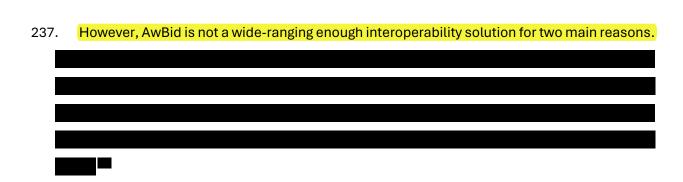Expert Report of Parag Pathak – Highly Confidential

non-Google exchanges. With access to third-party exchanges, Google Ads advertisers would have more inventory available to them to make relevant matches.

235.   Publishers also benefit from non-discriminatory interoperability for Google Ads and third-party exchanges. Currently, publishers can only access Google Ads from AdX and only access AdX from DFP. Publishers that do not contract with AdX would have access to demand from Google Ads through other exchanges if Google Ads became interoperable with third-party exchanges. Furthermore, if Google Ads demand is no longer exclusive to AdX, publishers could leave DFP for an ad server that best meets their needs without losing access to Google Ads demand.

236.   Google already grants limited interoperability between Google Ads and third-party exchanges via its AwBid program. Google launched the AwBid program after recognizing that AdX did not provide sufficient inventory access for retargeting for its Google Ads advertisers. ██████ ██ ██ ██████████████████████████████[52] Furthermore, AwBid's mission statement is "to increase the access of GDA [Google Ads] advertisers, specifically remarketing, dynamic remarketing advertisers; Grow google [sic] profit (net revenue) via expansions (demand) & margin optimizations."[253] Google Ads exclusivity led to a restriction of relevant retargeting impressions that advertisers on Google Ad could achieve.

237.   ==However, AwBid is not a wide-ranging enough interoperability solution for two main reasons.== ██ ██ ██ ██ ██████ ██

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[252] *See* GOOG-DOJ-14430534 at 534. ████████████████████████████████ ████████████████

[253] *See* GOOG-DOJ-14298902 at-905. Undated. "AwBid Overview" - Internal Google presentation.

[254] ██ ████████████████████████████████

84